



Prediction of asthma exacerbations among children through integrating air pollution, upper atmosphere, and school health surveillances

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Abstract:

Climatic factors and air pollution are important in predicting asthma exacerbations among children. This study was designed to determine if a relationship exists between asthma exacerbations among elementary school children and the combined effect of daily upper atmosphere observations (temperature, relative humidity, dew point, and mixing ratio) and daily air pollution (particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, and ozone) and, if so, to predict asthma exacerbations among children using a mathematical model. Using an ecological study design, school health records of 168,825 students in elementary schools enrolled in "Health eTools for Schools" within 49 Pennsylvania counties were analyzed. Data representing asthma exacerbations were originally recorded by school nurses as the type of treatment given to a student during a clinic visit on a particular day. Daily upper atmosphere measurements from ground level to the 850-mb pressure level and air pollution measurements were obtained. A generalized estimating equation model was used to predict the occurrence of >48 asthma exacerbations, the daily mean for 2008-2010. The greatest occurrence of asthma among school children was in the fall, followed by summer, spring, and winter. Upper atmosphere temperature, dew point, mixing ratio, and six air pollutants as well as their interactions predicted the probability of asthma exacerbations occurring among children. Monitoring of upper atmosphere observation data and air pollutants over time can be a reliable means for predicting increases of asthma exacerbations among elementary school children. Such predictions could help parents and school officials implement effective precautionary measures.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Meteorological Factors

Air Pollution: Interaction with Temperature, Ozone, Particulate Matter, Other Air Pollution

Air Pollution (other): SO₂, NO₂, CO

Geographic Feature:

resource focuses on specific type of geography

Climate Change and Human Health Literature Portal

None or Unspecified

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Respiratory Effect

Respiratory Effect: Asthma

Model/Methodology:

type of model used or methodology development is a focus of resource

Methodology

Population of Concern: A focus of content

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Children

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified